

WHAT IS CLAIMED IS:

1. A transfer material comprising at least three layers of
a first metal layer as a carrier,
5 a second metal layer as a wiring pattern,
a peel layer that is sandwiched between the first metal layer and the
second metal layer and allows the first metal layer and the second metal layer
to be adhered releasably,
wherein a convex portion corresponding to the wiring pattern is
10 formed on the surface portion of the first metal layer, and
the peel layer and the second metal layer are formed on a region of the
convex portions.
2. The transfer material according to claim 1, wherein each of the first
15 metal layer and the second metal layer comprises at least one metal selected
from the group consisting of copper, aluminum, silver, and nickel.
3. The transfer material according to claim 1, wherein the first metal
layer and the second metal layer comprise the same metal component.
- 20 4. The transfer material according to claim 2, wherein the first metal
layer and the second metal layer comprise a copper foil.
5. The transfer material according to claim 4, wherein the peel layer
25 comprises a material to be etched with a copper etching liquid.
6. The transfer material according to claim 1, wherein a height of the
convex portion in the first metal layer is 1 to 12 μ m.
- 30 7. The transfer material according to claim 1, wherein a thickness of the
peel layer is 1 μ m or less.
8. The transfer material according to claim 1, wherein the peel layer is
an organic layer or a metal plating layer.
- 35 9. The transfer material according to claim 8, wherein the peel layer is
an Au plating layer.

10. The transfer material according to claim 1, wherein an adhesive strength between the first metal layer and the second metal layer via the peel layer is 50 N/m or less.

5

11. The transfer material according to claim 1, wherein a thickness of the first metal layer is 4 to 40 μm and a thickness of the second metal layer is 1 to 35 μm .

10 12. The transfer material according to claim 1, further comprising a third metal layer on the second metal layer.

13. The transfer material according to claim 12, wherein a thickness of the third metal layer is 2 to 30 μm .

15

14. The transfer material according to claim 12, wherein the first to third metal layers comprise the same metal component.

15. The transfer material according to claim 12, wherein the third metal layer comprises gold.

20

16. The transfer material according to claim 12, further comprising a fourth metal layer on the third metal layer, wherein the fourth metal layer comprises a metal component that is chemically stable with respect to an etching liquid corroding the first to third metal layers.

25

17. The transfer material according to claim 16, wherein the fourth metal layer comprises at least one metal selected from the group consisting of gold, silver, nickel, tin, bismuth, lead and copper, and has a thickness of 1 to 10 μm .

30

18. The transfer material according to claim 1, wherein a circuit component is formed by a printing method for electrically connecting to the second metal layer.

35

19. The transfer material according to claim 18, wherein the circuit component comprises at least one component selected from the group

consisting of an inductor, a capacitor and a resistor.

20. The transfer material according to claim 18, wherein the circuit component is formed of a material comprising an inorganic filler and a resin composition.

21. The transfer material according to claim 18, wherein the circuit component is formed of a material comprising an inorganic filler, an organic binder and a plasticizer.

22. A transfer material comprising at least two layers of a first metal layer as a carrier, and a second metal layer as a wiring pattern, wherein a circuit component is formed on the first metal layer by a printing method for electrically connecting to the second metal layer.

23. The transfer material according to claim 22, wherein a peel layer is formed between the first metal layer and the second metal layer, and adheres the first metal layer to the second metal layer releasably.

24. The transfer material according to claim 23, wherein a thickness of the peel layer is 1 μ m or less.

25. The transfer material according to claim 23, wherein the peel layer is an organic layer or a metal plating layer.

26. The transfer material according to claim 25, wherein the peel layer is an Au plating layer.

27. The transfer material according to claim 23, wherein an adhesive strength between the first metal layer and the second metal layer via the peel layer is 10 N/m or more and 50 N/m or less.

28. The transfer material according to claim 22, wherein the circuit component comprises at least one component selected from the group consisting of an inductor, a capacitor and a resistor.

29. The transfer material according to claim 22, wherein the circuit component is formed of a material comprising an inorganic filler and a resin composition.

5 30. The transfer material according to claim 22, wherein the circuit component is formed of a material comprising an inorganic filler, an organic binder and a plasticizer.

10 31. The transfer material according to claim 22, wherein a thickness of the first metal layer is 4 to 100 μm , and a thickness of the second metal layer and the circuit component is 1 to 35 μm .

15 32. The transfer material according to claim 22, wherein a convex and concave portion is formed on the surface portion of the first metal layer, the convex portion corresponds to the wiring pattern of the second metal layer, and an upper layer on the first metal layer is formed on the convex portion.

20 33. The transfer material according to claim 32, wherein a height of the convex portion in the first metal layer is 1 to 12 μm .

25 34. The transfer material according to claim 22, wherein each of the first metal layer and the second metal layer comprises at least one metal selected from the group consisting of copper, aluminum, silver, and nickel.

35 35. The transfer material according to claim 22, wherein the first metal layer and the second metal layer comprise the same metal component.

30 36. A method for producing a transfer material, comprising forming a peel layer on a first metal layer, forming a second metal layer on the peel layer, and etching the second metal layer, the peel layer and a surface portion of the first metal layer by a chemical etching process, thereby forming the second metal layer and the peel layer into a wiring pattern, and at the same time, forming a convex and concave portion having a convex portion corresponding to the wiring pattern on the surface portion of the first metal layer.

37. The method for producing a transfer material according to claim 36, the method comprising, after the second metal layer is formed and before the etching is carried out,

5 (a) forming a plating resist on the second metal layer with the surface portion of the second metal layer exposed in the wiring pattern,

(b) forming a third metal layer by plating in a region where the second metal layer is exposed, and

10 (c) peeling off the plating resist;
thereafter, etching the second metal layer, the peel layer, and the surface portion the first metal layer in a region where the third metal layer is not formed by a chemical etching process.

38. The method for producing a transfer material according to claim 37, wherein the third metal layer is formed of a metal component chemically
15 stable with respect to an etchant used for the chemical etching process, and the third metal layer is allowed to serve as an etching resist in the chemical etching process.

39. The method for producing a transfer material according to claim 38,
20 wherein the third metal layer is formed of gold or silver.

40. The method for producing a transfer material according to claim 37, the method comprising, after the third metal layer is formed and before the plating resist is peeled off,

25 forming a fourth metal layer on the third metal layer by the use of a metal component chemically stable with respect to an etchant used for the chemical etching process, and thereafter,

30 peeling off the plating resist, and etching the second metal layer, the peeling layer and the surface portion of the first metal layer in a region where the third and fourth metal layers are not formed, by a chemical etching process.

41. The method for producing a transfer material according to claim 40, wherein the fourth metal layer is formed of a metal component chemically
35 stable with respect to the etchant used for the chemical etching process, and the fourth metal layer is allowed to serve as an etching resist in the chemical etching process.

42. The method for producing a transfer material according to claim 41,
wherein the fourth metal layer is formed of gold or silver.
- 5 43. The method for producing a transfer material according to claim 36,
wherein the second metal layer is formed by electrolytic plating.
44. The method for producing a transfer material according to claim 36,
wherein the first metal layer and the second metal layer are formed of the
10 same metal component.
45. The method for producing a transfer material according to claim 36,
wherein a depth of the surface portion of the first metal layer that is etched by
the chemical etching process is 1 to 12 μ m.
- 15 46. The method for producing a transfer material according to claim 36,
the method further comprising roughening the surface of the second metal
layer.
- 20 47. The method for producing a transfer material according to claim 46,
wherein an average central line roughness of the roughened surface of the
second metal layer is 2 μ m or more.
48. The method for producing a transfer material according to claim 36,
25 wherein a circuit component is formed by a printing method so that it is in
contact with the second metal layer.
49. The method for producing a transfer material according to claim 48,
wherein the printing method is a screen printing method.
- 30 50. The method for producing a transfer material according to claim 48,
wherein the circuit component is formed of a material comprising an inorganic
filler and a resin composition.
- 35 51. The method for producing a transfer material according to claim 48,
wherein the circuit component is formed of a material comprising an inorganic
filler, an organic binder and a plasticizer.

52. A method for producing a transfer material, comprising forming a second metal layer into a wiring pattern on the first metal layer, and

5 forming a circuit component by a printing method for electrically connecting to the second metal layer.

53. The method for producing a transfer material according to claim 52, wherein the circuit component is formed by a screen printing method.

10

54. The method for producing a transfer material according to claim 52, wherein the second metal layer is formed by plating.

15

55. A method for producing a transfer material, comprising forming a peel layer and a second metal layer on a first metal layer, processing the second metal layer and the peel layer into a wiring pattern, and

forming a circuit component by a printing method for electrically connecting to the second metal layer.

20

56. The method for producing a transfer material according to claim 55, wherein the circuit component is formed by a screen printing method.

25

57. The method for producing a transfer material according to claim 55, wherein the second metal layer and the peel layer are processed into the wiring pattern by a chemical etching process and at the same time, the convex and concave portion having a convex portion corresponding to the wiring pattern on the surface portion of the first metal layer.

30

58. The method for producing a transfer material according to claim 57, the method comprising, after the second metal layer is formed and before the etching is carried out,

(a) forming a plating resist on the second metal layer with the surface portion of the second metal layer exposed in the wiring pattern,

35

(b) forming a third metal layer by plating in a region where the second metal layer is exposed, and

(c) peeling off the plating resist;

thereafter, etching the second metal layer, the peel layer, and the surface portion of the first metal layer in a region where the third metal layer is not formed by a chemical etching process.

5 59. The method for producing a transfer material according to claim 58, wherein the third metal layer is formed of a metal component chemically stable with respect to an etchant used for the chemical etching process, and the third metal layer is allowed to serve as an etching resist in the chemical etching process.

10 60. The method for producing a transfer material according to claim 59, wherein the third metal layer is formed of gold or silver.

15 61. The method for producing a transfer material according to claim 58, the method comprising, after the third metal layer is formed and before the plating resist is peeled off,

forming a fourth metal layer on the third metal layer by the use of a metal component chemically stable with respect to an etchant used for the chemical etching process, and thereafter,

20 peeling off the plating resist, and etching the second metal layer, the peeling layer and the surface portion of the first metal layer in a region where the third and fourth metal layers are not formed by a chemical etching process.

25 62. The method for producing a transfer material according to claim 61, wherein the fourth metal layer is formed of a metal component chemically stable with respect to the etchant used for the chemical etching process and, the fourth metal layer is allowed to serve as an etching resist in the chemical etching process.

30 63. The method for producing a transfer material according to claim 62, wherein the fourth metal layer is formed of gold or silver.

35 64. The method for producing a transfer material according to claim 57, wherein the second metal layer is formed by electrolytic plating.

65. The method for producing a transfer material according to claim 57,

wherein the first metal layer and the second metal layer are formed of the same metal component.

5 66. The method for producing a transfer material according to claim 57, wherein a depth of the surface portion of the first metal layer that is etched by the chemical etching process is 1 to 12 μ m.

10 67. The method for producing a transfer material according to claim 57, the method further comprising roughening the surface of the second metal layer.

15 68. The method for producing a transfer material according to claim 67, wherein an average central line roughness of the roughened surface of the second metal layer is 2 μ m or more.

20 69. A wiring substrate comprising
an electric insulating substrate, and
a wiring pattern formed on at least one principal plane of the electric insulating substrate by a transfer method by the use of the transfer material according to claim 1,
wherein the wiring pattern is formed in the concave portion formed on the principal plane.

25 70. The wiring substrate according to claim 69, wherein the electric insulating substrate is provided with a through hole filled with a conductive composition, and the wiring pattern is electrically connected to the conductive composition.

30 71. The wiring substrate according to claim 69, wherein a depth of the concave portion is 1 to 12 μ m.

35 72. The wiring substrate according to claim 69, wherein the electric insulating substrate comprises an inorganic filler and a thermosetting resin, and has a through hole filled with a conductive composition.

73. The wiring substrate according to claim 72, wherein the inorganic filler comprises at least one inorganic filler selected from the group consisting

of Al_2O_3 , MgO , BN , AlN and SiO_2 , the content of the inorganic filler is 70 to 95 weight %, and the content of the thermosetting resin composition is 5 to 30 weight %.

5 74. The wiring substrate according to claim 69, wherein the electric insulating substrate is a reinforcer impregnated with a thermosetting resin, and the reinforcer is at least one selected from the group consisting of a woven fabric of a glass fiber, a non-woven fabric of a glass fiber, a woven fabric of a thermal resistant organic fiber and a non-woven fabric of a thermal resistant
10 organic fiber.

75. The wiring substrate according to claim 69, wherein the electric insulating substrate is formed of a ceramic.

15 76. The wiring substrate according to claim 75, wherein the ceramic comprises at least one component selected from the group consisting of Al_2O_3 , MgO , ZrO_2 , TiO_2 , SiO_2 , BeO , BN , CaO and glass, or a Bi-Ca-Nb-O containing ceramic.

20 77. The wiring substrate according to claim 69, further comprising a metal layer formed by plating on the wiring pattern that is formed by a transfer method in the concave portion on the principal plane.

25 78. The wiring substrate according to claim 69, comprising a semiconductor device connected to the wiring pattern formed in the concave portion on the principal plane, the semiconductor device being flip-chip bonded on the wiring pattern by positioning the bump of the semiconductor device in the concave portion.

30 79. A multi-layered wiring substrate having an inner via hole structure in which a plurality of wiring substrates are laminated,
 wherein at least one layer has a wiring substrate according to claim 69.

35 80. The wiring substrate according to claim 79, wherein at least one of the plurality of wiring substrates is a ceramic wiring substrate having an electric insulating substrate including a ceramic,

at least one of the ceramic wiring substrates has a convex wiring pattern formed on at least one principal plane,

the wiring substrate laminated on the principal plane having the convex wiring pattern is a composite wiring substrate having an electric insulating substrate including a thermosetting resin composition, and
5 the convex wiring pattern is embedded in the principal plane of the composite wiring substrate.

81. The wiring substrate according to claim 80, wherein the sintering
10 temperature of the ceramic wiring substrate is 1050°C or higher.

82. The wiring substrate according to claim 79, wherein at least two of the plurality of wiring substrates are ceramic wiring substrates having an electric insulating substrate including a ceramic,

15 at least one of the ceramic wiring substrates comprises a ceramic material different from the ceramic material of the other ceramic wiring substrates, and

a wiring substrate having an electric insulating substrate including a thermosetting resin composition is placed between the ceramic wiring
20 substrates each containing a different ceramic material.

83. The wiring substrate according to claim 79, wherein at least a top layer and a bottom layer of the plurality of wiring substrates are composite substrates having an electric insulating substrate including a thermosetting
25 resin composition, and an inside layer is a ceramic wiring substrate having an electric insulating substrate including a ceramic.

84. A wiring substrate, comprising an electric insulating substrate, and a wiring pattern and a circuit component that are formed on at least one
30 principal plane of the electric insulating substrate by a transfer method by the use of the transfer material according to claim 22, wherein the circuit component is electrically connected to the wiring pattern, and the circuit component and the wiring pattern are embedded in the principal plane.

85. The wiring substrate according to claim 84, wherein the electric
35 insulating substrate is provided with a through hole filled with a conductive composition, and the wiring pattern is electrically connected to the conductive

composition.

86. The wiring substrate according to claim 84, wherein the electric insulating substrate comprises an inorganic filler and a thermosetting resin,
5 and has a through hole filled with a conductive composition.

87. The wiring substrate according to claim 86, wherein the inorganic filler comprises at least one inorganic filler selected from the group consisting of Al_2O_3 , MgO , BN , AlN and SiO_2 , the content of the inorganic filler is 70 to 95
10 weight %, and the content of the thermosetting resin composition is 5 to 30 weight %.

88. The wiring substrate according to claim 84, wherein the electric insulating substrate is a reinforcer impregnated with a thermosetting resin,
15 and the reinforcer is at least one selected from the group consisting of a woven fabric of a glass fiber, a non-woven fabric of a glass fiber, a woven fabric of a thermal resistant organic fiber and a non-woven fabric of a thermal resistant organic fiber.

89. The wiring substrate according to claim 84, wherein the electric insulating substrate is formed of a ceramic material.
20

90. The wiring substrate according to claim 89, wherein the ceramic material comprises at least one component selected from the group consisting of Al_2O_3 , MgO , ZrO_2 , TiO_2 , SiO_2 , BeO , BN , CaO and glass, or a Bi-Ca-Nb-O
25 containing ceramic.

91. A multi-layered wiring substrate having an inner via hole structure in which a plurality of wiring substrates are laminated,
30 wherein at least one layer has a wiring substrate according to claim 84.

92. The wiring substrate according to claim 91, wherein at least one of the plurality of wiring substrates is a ceramic wiring substrate having an electric
35 insulating substrate including a ceramic,
at least one of the ceramic wiring substrates has a convex wiring pattern formed on at least one principal plane,

the wiring substrate laminated on the principal plane having the convex wiring pattern is a composite wiring substrate having an electric insulating substrate including a thermosetting resin composition, and the convex wiring pattern is embedded in the principal plane of the composite wiring substrate.

93. The wiring substrate according to claim 92, wherein the sintering temperature of the ceramic wiring substrate is 1050°C or higher.

94. The wiring substrate according to claim 91, wherein at least two of the plurality of wiring substrates are ceramic wiring substrates having an electric insulating substrate including a ceramic,

at least one of the ceramic wiring substrates comprises a ceramic material different from the ceramic material of the other ceramic wiring substrates, and

a wiring substrate having an electric insulating substrate including a thermosetting resin composition is placed between the ceramic wiring substrates each containing a different ceramic material.

95. The wiring substrate according to claim 91, wherein at least a top layer and a bottom layer of the plurality of wiring substrates are composite substrates having an electric insulating substrate including a thermosetting resin composition, and an inside layer is a ceramic wiring substrate having an electric insulating substrate including a ceramic.

96. A method for producing a wiring substrate using the transfer material according to claim 1, the method comprising

pressing the side of the transfer material where the wiring pattern metal layer including at least a second metal layer is formed onto at least one principal plane of an uncured base material sheet, and

peeling off a first metal layer adhered to the second metal layer from the second metal layer, thereby transferring the wiring pattern metal layer to the base material sheet.

97. The method for producing a wiring substrate according to claim 96, wherein two or more of the uncured base material sheets to which the wiring pattern metal layer is transferred are laminated so as to form a laminate, and

all of the base material sheets of the laminate are cured at one time.

98. The method for producing a wiring substrate according to claim 96, wherein the base material sheet comprises an inorganic filler and a thermosetting resin composition, and has a through hole filled with the conductive composition.

99. The method for producing a wiring substrate according to claim 98, wherein the inorganic filler comprises at least one inorganic filler selected from the group consisting of Al_2O_3 , MgO , BN , AlN and SiO_2 , the content of the inorganic filler is 70 to 95 weight % with respect to an entire base material sheet, and the content of the thermosetting resin composition is 5 to 30 weight % with respect to an entire base material sheet.

100. The method for producing a wiring substrate according to claim 96, wherein the base material sheet is a reinforcer impregnated with a thermosetting resin, and the reinforcer is one selected from the group consisting of a woven fabric of a glass fiber, a non-woven fabric of a glass fiber, a woven fabric of a thermal resistant organic fiber and a non-woven fabric of a thermal resistant organic fiber.

101. The method for producing a wiring substrate according to claim 96, wherein the base material sheet comprises a polyimide.

102. The method for producing a wiring substrate according to claim 96, wherein the base material sheet is a ceramic sheet comprising an organic binder, a plasticizer and a ceramic powder comprising at least one ceramic selected from the group consisting of Al_2O_3 , MgO , ZrO_2 , TiO_2 , SiO_2 , BeO , BN , CaO and glass.

103. The method for producing a wiring substrate according to claim 102, comprising,
transferring the wiring pattern metal layer to both principal planes of the ceramic sheet by using the transfer material,
placing a constrained sheet on both surfaces or one surface of the ceramic sheet, the constrained sheet having, as a main component, an inorganic composition that substantially is not sintered nor shrunk at the

firing temperature of the ceramic sheet,

firing the ceramic sheet together with the constrained sheet, and
after firing, removing the constrained sheet so as to form a ceramic

wiring substrate.

5

104. The method for producing a wiring substrate according to claim 103,
comprising,

transferring the wiring pattern metal layer by the use of the transfer
material to at least one principal plane of the base material sheet including a
thermosetting resin composition, thereby forming a composite wiring
substrate, and

10

laminating the ceramic wiring substrate and the composite wiring
substrate, and heating and pressing the laminate so as to form a multi-
layered wiring substrate.

15

105. The method for producing a wiring substrate according to claim 103,
wherein the ceramic sheet is provided with a through hole before the wiring
pattern metal layer is transferred to the ceramic sheet by the use of the
transfer material, and the through hole is filled with a conductive
composition.

20

106. A method for producing a wiring substrate, comprising
providing a ceramic sheet with a through hole,
placing a constrained sheet, having an inorganic composition that
substantially is not sintered nor shrunk at the firing temperature of the
ceramic sheet as a main component, on both surfaces of the ceramic sheet
provided with a through hole,

25

firing the ceramic sheet together with the constrained sheet,
after firing, removing the constrained sheet,

30

filling the through hole with a thermosetting conductive composition
so as to form a ceramic substrate having a via conductor,

pressing the side where the wiring pattern metal layer including at
least a second metal layer is formed of the transfer material according to claim
1 onto at least one principal plane of an uncured base material sheet including
a thermosetting resin composition,

35

peeling off the first metal layer adhered to the second metal layer via
the peel layer from the second metal layer, thereby transferring the wiring

pattern metal layer to the base material sheet,

providing a base material sheet including the thermosetting resin composition with a through hole before or after the transfer, and filling the through hole with a conductive composition so as to form a composite wiring substrate having a via conductor, and

laminating the ceramic substrate and the composite wiring substrate, and heating and pressing the laminate so as to form a multi-layered wiring substrate.

107. The method for producing a wiring substrate according to claim 106, wherein a through hole for a pin for positioning the ceramic substrate with respect to the composite wiring substrate is formed at the same time the ceramic sheet is provided with a through hole.

108. The method for producing a wiring substrate according to claim 107, wherein a hole diameter of the through hole is made larger by 2 to 10 % than the hole diameter of the pin.

109. The method for producing a wiring substrate according to claim 96, wherein the wiring pattern metal layer is transferred by the use of the transfer material, and thereafter the wiring pattern metal layer formed on the surface of the base material sheet is plated.

110. A method for producing a wiring substrate using the transfer material according claim 22, the method comprising

pressing the side of the transfer material where the wiring pattern metal layer including at least a second metal layer is formed onto at least one principal plane of an uncured base material sheet, and

peeling off the first metal layer, thereby transferring at least the second metal layer and the circuit component to the base material sheet.

111. The method for producing a wiring substrate according to claim 110, wherein two or more of the uncured base material sheets after transfer are laminated so as to form a laminate, and all of the base material sheets of the laminate are cured in one time.

112. The method for producing a wiring substrate according to claim 110,

wherein the base material sheet comprises an inorganic filler and a thermosetting resin composition, and has a through hole filled with the conductive composition.

5 113. The method for producing a wiring substrate according to claim 112, wherein the inorganic filler comprises at least one inorganic filler selected from the group consisting of Al_2O_3 , MgO , BN , AlN and SiO_2 , the content of the inorganic filler is 70 to 95 weight % with respect to an entire base material sheet, and the content of the thermosetting resin composition is 5 to 30
10 weight % with respect to an entire base material sheet.

114. The method for producing a wiring substrate according to claim 110, wherein the base material sheet is a reinforcer impregnated with a thermosetting resin, and the reinforcer is one selected from the group
15 consisting of a woven fabric of a glass fiber, a non-woven fabric of a glass fiber, a woven fabric of a thermal resistant organic fiber and a non-woven fabric of a thermal resistant organic fiber.

115. The method for producing a wiring substrate according to claim 110,
20 wherein the base material sheet comprises a polyimide.

116. The method for producing a wiring substrate according to claim 110, wherein the base material sheet is a ceramic sheet comprising an organic binder, a plasticizer and a ceramic powder comprising at least one ceramic
25 selected from the group consisting of Al_2O_3 , MgO , ZrO_2 , TiO_2 , SiO_2 , BeO , BN , CaO and glass.

117. The method for producing a wiring substrate according to claim 116, comprising transferring the wiring pattern metal layer to both principal
30 planes of the ceramic sheet by using the transfer material,

placing a constrained sheet on both surfaces or one surface of the ceramic sheet, the constrained sheet having, as a main component, an inorganic composition that substantially is not sintered nor shrunk at the firing temperature of the ceramic sheet,
35 firing the ceramic sheet together with the constrained sheet, and after firing, removing the constrained sheet so as to form a ceramic wiring substrate.

118. The method for producing a wiring substrate according to claim 117, comprising,

transferring the wiring pattern metal layer by the use of the transfer material to at least one principal plane of the base material sheet including a thermosetting resin composition, thereby forming a composite wiring substrate, and

laminating the ceramic wiring substrate and the composite wiring substrate, and heating and pressing the laminate so as to form a multi-layered wiring substrate.

119. The method for producing a wiring substrate according to claim 117, wherein the ceramic sheet is provided with a through hole before the wiring pattern metal layer is transferred to the ceramic sheet by the use of the transfer material, and the through hole is filled with a conductive composition.

120. A method for producing a wiring substrate, comprising
providing a ceramic sheet with a through hole,
placing a constrained sheet, having an inorganic composition that substantially is not sintered nor shrunk at the firing temperature of the ceramic sheet as a main component, on both surfaces of the ceramic sheet provided with a through hole,
firing the ceramic sheet together with the constrained sheet,
after firing, removing the constrained sheet,
filling the through hole with a thermosetting conductive composition so as to form a ceramic substrate having a via conductor,
pressing the side where the wiring pattern metal layer including at least a second metal layer is formed of the transfer material according to claim 22 onto at least one principal plane of an uncured base material sheet including a thermosetting resin composition,

peeling off the first metal layer adhered to the second metal layer via the peel layer from the second metal layer, thereby transferring the wiring pattern metal layer to the base material sheet,
providing a base material sheet including the thermosetting resin composition with a through holes before or after the transfer, and filling the through hole with a conductive composition so as to form a composite wiring

substrate having a via conductor, and

laminating the ceramic substrate and the composite wiring substrate,
and heating and pressing the laminate so as to form a multi-layered wiring
substrate.

5

121. The method for producing a wiring substrate according to claim 119,
wherein a through hole for a pin for positioning the ceramic substrate with
respect to the composite wiring substrate is formed at the same time the
ceramic sheet is provided with a through hole.

10

122. The method for producing a wiring substrate according to claim 121,
wherein a hole diameter of the through hole is made larger by 2 to 10 % than
the hole diameter of the pin.

15

123. The method for producing a wiring substrate according to claim 110,
wherein the wiring pattern metal layer is transferred by the use of the
transfer material, and thereafter the wiring pattern metal layer formed on the
surface of the base material sheet is plated.